Practitioner's Docket No. 617-010120-US(PAR)

CHAPTER II

Preliminary Classification:

Proposed Class:

Subclass:

NOTE: "All applicants are requested to include a preliminary classification on newly filed patent applications. The preliminary classification, preferably class and subclass designations, should be identified in the upper right-hand corner of the letter of transmittal accompanying the application papers, for example 'Proposed Class 2, subclass 129.' " M.P.E.P., § 601, 7th ed.

TRANSMITTAL LETTER TO THE UNITED STATES ELECTED OFFICE (EO/US)

(ENTRY INTO U.S. NATIONAL PHASE UNDER CHAPTER II)

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/IB99/01412	27 July 1999	28 July 1998

TITLE OF INVENTION

INTER-SYSTEM HANDOVER

APPLICANT(S)

Sami USKELA

Box PCT
Assistant Commissioner for Patents
Washington D.C. 20231

ATTENTION: EO/US

CERTIFICATION UNDER 37 C.F.R. § 1.10*
(Express Mail label number is mandatory.)
(Express Mail certification is optional.)

I hereby certify that this Transmittal Letter and the papers indicated as being transmitted therewith is being deposited with the United States Postal Service on this date 26 January 2001, in an envelope as "Express Mail Post Office to Addressee" Mailing Label Number EL627424945US, addressed to the: Assistant Commissioner for Patents, Washington, D.C. 20231.

Debra G. Conrad
(type or print name of person mailing paper)

Debra G. Conrad
Signature of person mailing paper

WARNING: *Certificate of mailing (first class) or facsimile transmission procedures of 37 C.F.R. § 1.8 cannot be used to obtain a date of mailing or transmission for this correspondence.*

"WARNING: *Each paper or fee filed by "Express Mail" **must** have the number of the "Express Mail" mailing label placed thereon prior to mailing. 37 C.F.R. § 1.10(b).*
*"Since the filing of correspondence under § 1.10 without the Express Mail mailing label thereon is an oversight that can be avoided by the exercise of reasonable care, requests for waiver of this requirement will **not** be granted on petition." Notice of Oct. 24, 1996, 60 Fed. Reg. 56,439, at 56,442.*

NOTE: To avoid abandonment of the application, the applicant shall furnish to the USPTO, not later than 20 months from the priority date: (1) a copy of the international application, unless it has been previously communicated by the International Bureau or unless it was originally filed in the USPTO; and (2) the basic national fee (see 37 C.F.R. § 1.492(a)). The 30-month time limit may not be extended. 37 C.F.R. § 1.495.

***WARNING:** Where the items are those which can be submitted to complete the entry of the international application into the national phase are subsequent to 30 months from the priority date the application is still considered to be in the international state and if mailing procedures are utilized to obtain a date the express mail procedure of 37 C.F.R. § 1.10 must be used (since international application papers are not covered by an ordinary certificate of mailing—See 37 C.F.R. § 1.8.*

NOTE: Documents and fees must be clearly identified as a submission to enter the national state under 35 U.S.C. § 371 otherwise the submission will be considered as being made under 35 U.S.C. § 111. 37 C.F.R. § 1.494(f).

I. Applicant herewith submits to the United States Elected Office (EO/US) the following items under 35 U.S.C. § 371:

a. ☒ This express request to immediately begin national examination procedures (35 U.S.C. § 371(f)).

b. ☒ The U.S. National Fee (35 U.S.C. § 371(c)(1)) and other fees (37 C.F.R. § 1.492) as indicated below:

2. Fees

CLAIMS FEE	(1) FOR	(2) NUMBER FILED	(3) NUMBER EXTRA	(4) RATE	(5) CALCULATIONS
☒*	TOTAL CLAIMS 14	13 −20=	0	× $18.00 =	$ 0
	INDEPENDENT CLAIMS 1	1 −3=	0	× $80.00	0
	MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ $270.00	
BASIC FEE**	☐ U.S. PTO WAS INTERNATIONAL PRELIMINARY EXAMINATION AUTHORITY Where an International preliminary examination fee as set forth in § 1.482 has been paid on the international application to the U.S. PTO: ☐ and the international preliminary examination report states that the criteria of novelty, inventive step (non-obviousness) and industrial activity, as defined in PCT Article 33(1) to (4) have been satisfied for all the claims presented in the application entering the national stage (37 C.F.R. § 1.492(a)(4)) ..... $100.00 ☐ and the above requirements are not met (37 C.F.R. § 1.492(a)(1)) ..... $690.00 ☒ U.S. PTO WAS NOT INTERNATIONAL PRELIMINARY EXAMINATION AUTHORITY Where no international preliminary examination fee as set forth in § 1.482 has been paid to the U.S. PTO, and payment of an international search fee as set forth in § 1.445(a)(2) to the U.S. PTO: ☐ has been paid (37 C.F.R. § 1.492(a)(2)) ..... $710.00 ☐ has not been paid (37 C.F.R. § 1.492(a)(3)) ..... $1,000. ☒ where a search report on the international application has been prepared by the European Patent Office or the Japanese Patent Office (37 C.F.R. § 1.492(a)(5)) $860.00				860.00
	Total of above Calculations				= 860.00
SMALL ENTITY	Reduction by 1/2 for filing by small entity, if applicable. Affidavit must be filed also. (note 37 C.F.R. § 1.9, 1.27, 1.28)				−
	Subtotal				
	Total National Fee				$ 860.00
	Fee for recording the enclosed assignment document $40.00 (37 C.F.R. § 1.21(h)). (See Item 13 below). See attached "ASSIGNMENT COVER SHEET".				
TOTAL	Total Fees enclosed				$ 860.00

*See attached Preliminary Amendment Reducing the Number of Claims.

i. ☒ A check in the amount of 860.00 to cover the above fees is enclosed.

ii. ☐ Please charge Account No. _____ in the amount of $ _____. A duplicate copy of this sheet is enclosed.

**WARNING: *"To avoid abandonment of the application the applicant shall furnish to the United States Patent and Trademark Office not later than the expiration of 30 months from the priority date: * * * (2) the basic national fee (see § 1.492(a)). The 30-month time limit may not be extended." 37 C.F.R. § 1.495(b).*

WARNING: *If the translation of the international application and/or the oath or declaration have not been submitted by the applicant within thirty (30) months from the priority date, such requirements may be met within a time period set by the Office. 37 C.F.R. § 1.495(b)(2). The payment of the surcharge set forth in § 1.492(e) is required as a condition for accepting the oath or declaration later than thirty (30) months after the priority date. The payment of the processing fee set forth in § 1.492(f) is required for acceptance of an English translation later than thirty (30) months after the priority date. Failure to comply with these requirements will result in abandonment of the application. The provisions of § 1.136 apply to the period which is set. Notice of Jan. 3, 1993, 1147 O.G. 29 to 40.*

3. ☒ A copy of the International application as filed (35 U.S.C. § 371(c)(2)):

NOTE: *Section 1.495 (b) was amended to require that the basic national fee and a copy of the international application must be filed with the Office by 30 months from the priority date to avoid abandonment. "The International Bureau normally provides the copy of the international application to the Office in accordance with PCT Article 20. At the same time, the International Bureau notifies applicant of the communication to the Office. In accordance with PCT Rule 47.1, that notice shall be accepted by all designated offices as conclusive evidence that the communication has duly taken place. Thus, if the applicant desires to enter the national stage, the applicant normally need only check to be sure the notice from the International Bureau has been received and then pay the basic national fee by 30 months from the priority date." Notice of Jan. 7, 1993, 1147 O.G. 29 to 40, at 35-36. See item 14c below.*

a. ☐ is transmitted herewith.

b. ☐ is not required, as the application was filed with the United States Receiving Office.

c. ☒ has been transmitted

i. ☒ by the International Bureau.
Date of mailing of the application (from form PCT/1B/308): 2/10/2000

ii. ☐ by applicant on _____
Date

4. ☐ A translation of the International application into the English language (35 U.S.C. § 371(c)(2)):

a. ☐ is transmitted herewith.

b. ☐ is not required as the application was filed in English.

c. ☐ was previously transmitted by applicant on _____
Date

d. ☐ will follow.

5. ☒ Amendments to the claims of the International application under PCT Article 19 (35 U.S.C. § 371(c)(3)):

NOTE: The Notice of January 7, 1993 points out that 37 C.F.R. § 1.495(a) was amended to clarify the existing and continuing practice that PCT Article 19 amendments must be submitted by 30 months from the priority date and this deadline may not be extended. The Notice further advises that: "The failure to do so will not result in loss of the subject matter of the PCT Article 19 amendments. Applicant may submit that subject matter in a preliminary amendment filed under section 1.121. In many cases, filing an amendment under section 1.121 is preferable since grammatical or idiomatic errors may be corrected." 1147 O.G. 29-40, at 36.

a. ☐ are transmitted herewith.

b. ☐ have been transmitted

i. ☐ by the International Bureau.
Date of mailing of the amendment (from form PCT/1B/308): ______.

ii. ☐ by applicant on (date) ______.
Date

c. ☒ have not been transmitted as

i. ☒ applicant chose not to make amendments under PCT Article 19.
Date of mailing of Search Report (from form PCT/ISA/210.): 11/22/99

ii. ☐ the time limit for the submission of amendments has not yet expired. The amendments or a statement that amendments have not been made will be transmitted before the expiration of the time limit under PCT Rule 46.1.

6. ☒ A translation of the amendments to the claims under PCT Article 19 (38 U.S.C. § 371(c)(3)):

a. ☐ is transmitted herewith.

b. ☐ is not required as the amendments were made in the English language.

c. ☒ has not been transmitted for reasons indicated at point 5(c) above.

7. ☒ A copy of the international examination report (PCT/IPEA/409)

☒ is transmitted herewith.

☐ is not required as the application was filed with the United States Receiving Office.

8. ☐ Annex(es) to the international preliminary examination report

a. ☐ is/are transmitted herewith.

b. ☐ is/are not required as the application was filed with the United States Receiving Office.

9. ☐ A translation of the annexes to the international preliminary examination report

a. ☐ Is transmitted herewith.

b. ☐ is not required as the annexes are in the English language.

10. ☒ An oath or declaration of the inventor (35 U.S.C. § 371(c)(4)) complying with 35 U.S.C. § 115

a. ☐ was previously submitted by applicant on _____.
Date

b. ☐ is submitted herewith, and such oath or declaration

i. ☐ is attached to the application.

ii. ☐ identifies the application and any amendments under PCT Article 19 that were transmitted as stated in points 3(b) or 3(c) and 5(b); and states that they were reviewed by the inventor as required by 37 C.F.R. § 1.70.

iii. ☒ will follow.

II. Other document(s) or information included:

11. ☒ An International Search Report (PCT/ISA/210) or Declaration under PCT Article 17(2)(a):

a. ☒ is transmitted herewith.

b. ☐ has been transmitted by the International Bureau.
Date of mailing (from form PCT/IB/308): _____.

c. ☐ is not required, as the application was searched by the United States International Searching Authority.

d. ☐ will be transmitted promptly upon request.

e. ☐ has been submitted by applicant on _____.
Date

12. ☒ An Information Disclosure Statement under 37 C.F.R. §§ 1.97 and 1.98:

a. ☒ is transmitted herewith.

Also transmitted herewith is/are:

☒ Form PTO-1449 (PTO/SB/08A and 08B).

☒ Copies of citations listed.

b. ☐ will be transmitted within THREE MONTHS of the date of submission of requirements under 35 U.S.C. § 371(c).

c. ☐ was previously submitted by applicant on _____.
Date

13. ☐ An assignment document is transmitted herewith for recording.

A separate ☐ "COVER SHEET FOR ASSIGNMENT (DOCUMENT) ACCOMPANYING NEW PATENT APPLICATION" or ☐ FORM PTO 1595 is also attached.

_____

_____

_____

14. ☒ Additional documents:

a. ☒ Copy of request (PCT/RO/101)

b. ☒ International Publication No. WO 00/07402

i. ☒ Specification, claims and drawing

ii. ☐ Front page only

c. ☒ Preliminary amendment (37 C.F.R. § 1.121)

d. ☒ Other

PCT/IB/308, PCT/IPEA/401, PCT/IPEA/408, PCT/IPEA/416, PCT/IPEA/409

15. ☒ The above checked items are being transmitted

a. ☒ before 30 months from any claimed priority date.

b. ☐ after 30 months.

16. ☐ Certain requirements under 35 U.S.C. § 371 were previously submitted by the applicant on _____, namely:

AUTHORIZATION TO CHARGE ADDITIONAL FEES

WARNING: *Accurately count claims, especially multiple dependant claims, to avoid unexpected high charges if extra claims are authorized.*

NOTE: "A written request may be submitted in an application that is an authorization to treat any concurrent or future reply, requiring a petition for an extension of time under this paragraph for its timely submission, as incorporating a petition for extension of time for the appropriate length of time. An authorization to charge all required fees, fees under § 1.17, or all required extension of time fees will be treated as a constructive petition for an extension of time in any concurrent or future reply requiring a petition for an extension of time under this paragraph for its timely submission. Submission of the fee set forth in § 1.17(a) will also be treated as a constructive petition for an extension of time in any concurrent reply requiring a petition for an extension of time under this paragraph for its timely submission." 37 C.F.R. § 1.136(a)(3).

NOTE: "Amounts of twenty-five dollars or less will not be returned unless specifically requested within a reasonable time, nor will the payer be notified of such amounts; amounts over twenty-five dollars may be returned by check or, if requested, by credit to a deposit account." 37 C.F.R. § 1.26(a).

☒ The Commissioner is hereby authorized to charge the following additional fees that may be required by this paper and during the entire pendency of this application to Account No. **16-1350**.

☒ 37 C.F.R. § 1.492(a)(1), (2), (3), and (4) (filing fees)

WARNING: *Because failure to pay the national fee within 30 months without extension (37 C.F.R. § 1.495(b)(2)) results in abandonment of the application, it would be best to always check the above box.*

☒ 37 C.F.R. § 1.492(b), (c) and (d) (presentation of extra claims)

NOTE: Because additional fees for excess or multiple dependent claims not paid on filing or on later presentation must only be paid or these claims cancelled by amendment prior to the expiration of the time period set for response by the PTO in any notice of fee deficiency (37 C.F.R. § 1.492(d)), it might be best not to authorize the PTO to charge additional claim fees, except possible when dealing with amendments after final action.

☒ 37 C.F.R. § 1.17 (application processing fees)

☐ 37 C.F.R. § 1.17(a)(1)–(5) (extension fees pursuant to § 1.136(a).

☐ 37 C.F.R. § 1.18 (issue fee at or before mailing of Notice of Allowance, pursuant to 37 C.F.R. § 1.311(b))

NOTE: Where an authorization to charge the issue fee to a deposit account has been filed before the mailing of a Notice of Allowance, the issue fee will be automatically charged to the deposit account at the time of mailing the notice of allowance. 37 C.F.R. § 1.311(b).

NOTE: 37 C.F.R. § 1.28(b) requires "Notification of any change in loss of entitlement to small entity status must be filed in the application . . . prior to paying, or at the time of paying . . . issue fee." From the wording of 37 C.F.R. § 1.28(b): (a) notification of change of status must be made even if the fee is paid as "other than a small entity" and (b) no notification is required if the change is to another small entity.

☒ 37 C.F.R. § 1.492(e) and (f) (surcharge fees for filing the declaration and/or filing an English translation of an International Application later than 30 months after the priority date).

PLEASE SEND ALL CORRESPONDENCE TO:

SIGNATURE OF PRACTITIONER

Reg. No.: 24,622

Clarence A. Green

Tel. No.: (203) 259-1800

(type or print name of practitioner)

PERMAN & GREEN, LLP

Customer No.: 2512

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425 Post Road, Fairfield, Connecticut 06430, USA

PLEASE SEND ALL CORRESPONDENCE TO:

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Express Mail No.: EL627424945US

In re Application of: Sami USKELA

INTERNATIONAL APPLICATION NO.: PCT/IB99/01412

INTERNATIONAL FILING DATE: 27 July 1999

FILING DATE: Herewith

TITLE: INTER-SYSTEM HANDOVER

ATTORNEY DOCKET NO.: 617-010120-US(PAR)

Box PCT
The Commissioner of Patents and Trademarks
Washington, D.C. 20231

PRELIMINARY AMENDMENT

Dear Sir:

Please amend the above-identified, enclosed patent application as follows:

IN THE SPECIFICATION:

Please amend the specification as shown below.

Page 1, on the line after the title, please insert --FIELD OF THE INVENTION--.

Page 1, on the line before the 2nd paragraph, please insert --BACKGROUND OF THE INVENTION--.

Page 2, line 2 of the first paragraph, please delete "the network" and insert --be network--.

Page 3, on the line before the first paragraph, please insert --SUMMARY OF THE INVENTION--.

Page 4, on the line before the 3rd paragraph, please insert --BRIEF DESCRIPTION OF THE DRAWINGS--.

Page 4, on the line before the last paragraph, please insert --DETAILED DESCRIPTION OF PREFERRED EMBODIMENT--.

Page 4, last paragraph, 4th line, please delete "41" and insert --42--.

Page 5, first paragraph, line 1, please delete "46" and insert --44--

Page 5, paragraph 3, line 2, delete "46" and insert --44--.

Page 5, paragraph 3, line 5, after the word "centre" please insert --44--.

Page 5, paragraph 3, line 7, please delete "45" and insert --47--.

Page 5, paragraph 3, line 9, after the word "centre" please insert --44--, and after the word "connected" please add --,--.

Page 5, paragraph 3, line 10, after the word "base station" please insert --45--.

Page 5, paragraph 3, line 11, please delete "46" and insert --44--.

Page 5, paragraph 3, line 13, please delete "46" and insert --44--.

Page 6, paragraph 1, line 3, after the word "MSC" please insert --46--.

Page 6, paragraph 3, line 4, after the word "MSC" please insert --44--.

Page 6, paragraph 3, line 6, after the word "MSC" please insert --44--.

IN THE CLAIMS:

On Page 11, after the heading "CLAIMS" and before claim 1, please insert --What is claimed is:--

Please amend Claims 3, 4, 5, 7, 9, 10, 11, 12, and 13 as shown below.

Claim 3, line 1, delete "or 2".

Claim 4, line 1, delete "or 2".

Claim 5, line 1, delete "any preceding claim" and insert --claim 1--.

Claim 7, line 1, delete "any of claims 1 to 4" and insert --claim 1--.

Claim 9, line 1, delete "any preceding claim" and insert --claim 1--.

Claim 10, line 1, delete "any preceding claim" and insert --claim 1--.

Claim 11, line 1, delete "any preceding claim" and insert --claim 1--.

Claim 12, line 1, delete "any preceding claim" and insert --claim 1,--.

Claim 13, line 1, delete "any preceding claim" and insert --claim 1--.

PLEASE DELETE CLAIM 14.

REMARKS

Please enter this preliminary amendment prior to calculation of the fees.

Respectfully submitted,

Clarence A. Green Reg. No.: 24,622
PERMAN & GREEN, LLP
425 Post Road, Fairfield, CT 06430
(203) 259-1800

26 Jun 2001
Date

Customer No.: 2512

INTER-SYSTEM HANDOVER

This invention relates to a system of handover for mobile stations, for example in a cellular radio telecommunications network.

Figure 1 shows schematically the configuration of a typical cellular radio telecommunications network. The network comprises a number of base-stations (BSs) 1, 2, 3 etc. Each base-station has a radio transceiver capable of transmitting radio signals to and receiving radio signals from the area of a cell 4, 5 etc. next to the base-station. By means of these signals the base-station can communicate with a mobile station (MS) 6 in that cell, which itself includes a radio transceiver. Each base station is connected to a mobile system controller (MSC) 7, which is linked in turn to the public telephone network 8. By means of this system a user of the MS 6 can establish a telephone call to the public network 8 via the BS in whose cell the MS is located.

The location of the MS could be fixed (for example if it is providing radio communications for a fixed building) or the MS could be moveable (for example if it is a hand portable transceiver or "mobile phone"). When the MS is moveable it may move between cells of the cellular radio system. As it moves from one cell (the "old cell") to another cell (the "new cell") there is a need to hand it over from communication with the BS of the old cell to the BS of the new cell without dropping the call due to a break in communications between the mobile station and the network. This process is known as handover. A need can also arise to hand over a MS whose location is fixed, for example if atmospheric conditions affect its communications with the old BS and call quality can be improved by handing it over to another BS or if there is a need to free up capacity of the old BS.

In a conventional cellular radio system handover is controlled automatically by the MSC. Handover can be initiated by the MS or the network dependent, for example, on the quality of the signalling between the MS and the old and new BSs.

When a new cellular network is being introduced it can take some time to install all the base-stations and associated apparatus. Therefore, there is a delay before the new network provides full geographical coverage. Figure 2 illustrates the situation: an existing cellular network provides full geographical coverage by means of cells 20-27 but the new cellular network provides incomplete geographical coverage by means of only cells 28 and 29. This presents a significant commercial problem for the operator of the new network. If the new network is launched for use before its geographical coverage is complete then customers will be dissatisfied by its inferior coverage to the old network. However, the cost of the infrastructure of the new network is high and no return can be gained on it until it is in use.

It has been proposed to tackle this problem by allowing mobile stations using the new network to be handed over to cells of the old network when they move outside the coverage of the new network. For instance, when a mobile station moves from 30 to 31 in figure 2 it could be handed over from the base station of cell 28 (in the new network) to that of cell 21 (in the old network). However, the base-stations of cells 28 and 21 are in different networks and are therefore not linked by a common MSC, so conventional handover processes cannot be used. One solution to this could be to modify the old network to allow it to support inter-network handover. However, modifying the old network would be expensive and inconvenient.

There is therefore a need for a new method for handover between two telecommunications networks.

According to the present invention there is provided a method for performing handover of a mobile station communicating in a first call via a first network to communication in a second call via a second network, comprising: generating a request for handover; establishing the second call between the first network and the mobile station via the second network; and transferring data communication between the mobile station and the first network from the first call to the second call.

The method preferably also comprises the step of releasing the first call after data communication between the mobile station and the first network has been transferred from the first call to the second call. The said data communication is suitably communication of user data such as speech or other communication information.

The request for handover may be generated by the mobile station or the first network. Preferably the one of those entities generating the request transmits a message to the other of those entities to request the handover.

The mobile station may originate the second call. In that case it is preferred that the first network transmits to the mobile station data indicating an identification for the handover operation. Subsequently the mobile station may transmit to the second network data indicating that identification; and when the second call has been established the second network may transmit to the first network data indicating that identification. In response to receiving the identification in this way the first network may initiate transfer of the data communication from the first call to the second call.

The first network may originate the second call. In that case it is preferred that the mobile station transmits its identification in the second network (e.g. its MSISDN in the second network) to the first network and the first network uses that identification in originating the second call.

The geographical coverage of the second network may suitably be greater than that of the first network, at least in the region of the mobile station's location.

The first and second networks may suitably be cellular telephone networks. The mobile station may suitably be capable of communicating by radio with the first and second networks. The first and second calls may both be telephone calls. The mobile station may, for example, be a radio telephone.

The present invention will now be described by way of example with reference to the accompanying drawings, in which:

figure 1 shows schematically the configuration of a typical cellular radio telecommunications network;

figure 2 shows coverage of two overlapping telecommunications networks;

figure 3 illustrates a handover process;

figure 4 illustrates information flow for a mobile station triggered handover with a mobile terminated call;

figure 5 illustrates information flow for a network triggered handover with a mobile terminated call;

figure 6 illustrates information flow for a mobile station triggered handover with a mobile originated call; and

figure 7 illustrates information flow for a network triggered handover with a mobile originated call.

The handover process illustrated in figure 3 allows a mobile station 39 to be handed over between two telecommunications networks. In this illustration the mobile station moves from cell 40 to cell 41. Cell 40 is the cell of base-station 42 in network NW1. Base-station 41 is connected to the public telephone network 43 via an MSC 44 of network NW1. Cell 41 is the cell of base-station 45 in network NW2. Base-station 45 is connected to the public telephone network 43 via an MSC 46 of network NW2.

Initially the MS 39 is in communication with BS 42 and MSC 46 by means of a call 47 using the protocol of network NW1. When the MS moves away from the BS 42 it reaches a zone 48 where cells 40 and 41 overlap and the MS can communicate with both BS 42 and BS 45. Whilst the MS is in that overlap zone 48 it can be handed over from BS 42 to BS 45. The handover can be initiated by the mobile station, for example if it detects a greater signal strength or a lesser error rate for communications with BS 45 than with BS 42. Alternatively the handover can be initiated by the network, for example if it detects that communications between base-station 42 and mobile station 39 have a signal strength that falls below or an error rate that rises above pre-set thresholds, or if it is desired to free up capacity of base station 42 by handing the MS 39 off to BS 45.

The mobile station is capable of maintaining a call with a base-station of network NW1 at the same time as maintaining a call with a base-station of network NW2. Dual band mobile stations of this general type are well-known. Such mobile stations can make the normal location updates to both networks.

Once handover has been initiated, by the mobile station or the network, a second call 49 is established between the mobile station 39 and the MSC 46. This call passes over network NW1 via the base station 45. Meanwhile the original call 47 is maintained. Thus at this stage there are two calls in progress at once from the mobile switching centre of network NW1 to the mobile station 39. Once the second call 49 has been established network NW1 routes the data formerly being carried by the original call 47 over the second call 49. Then the original call 45 can be released. The mobile station 39 then communicates with the mobile switching centre of the network NW1 to which it was originally connected only via a base station of network NW2. Thus the mobile station has in effect been handed off to network NW2, although the call is still routed through the MSC 46 of network NW1. If the call passed onward to the public telephone network 43 from the MSC 46 (rather than to another mobile station in network NW1, for example) then this arrangement could be inefficient. To overcome this there could be

provided means for optimising the routing of the call after handover has taken place, for example by routing the call to the public telephone network directly from the MSC of network NW2 rather than via that of NW1.

Figures 4 to 7 illustrate possible ways of implementing this type of handover.

Figure 4 shows the signalling used for a mobile station triggered handover when mobile terminated calls are used. Initially the mobile station is in communication with network NW1 over call 47. When the MS 39 discovers that inter-system handover is required it sends a handover request 50 to the MSC of network NW1. This handover request includes information that defines the identification number of the mobile station (its MSISDN) in network NW2. Then the MSC of network NW1 makes a new call (call 49) to that MSISDN number. This could be done using ISUP or TUP signalling. A request 51 for this new call reaches network NW2 which sets up the call with the mobile MS 39 in the usual way for a mobile terminated call - for example by means of page and page_response messages 52, 53. The new call 49 is then set up (at 54). When the new call 49 has been set up network NW2 returns the normal message (e.g. ISUP_connect message 55) to indicate this fact to the network NW1 that originated the call 49. The network NW1 can then issue a message (indicated as a handover_confirmation message 56) to the mobile station to confirm that handover can now be made. Then the mobile station and the network NW1 connect call 47 to call 49 (at 57) so that user data that would formerly have been carried over call 47 is carried instead over call 49. Once all user data is being carried over call 49 then call 47 can be released (at 58). Handover is then complete.

Figure 5 shows the signalling used for a network triggered handover when mobile terminated calls are used. Initially the mobile station is in communication with network NW1 over call 47. When the network NW1 discovers that inter-system handover is required it sends a handover request 60 to the mobile station 39. In response to this handover request the mobile station 39 returns an

acknowledgement signal (indicated as handover_request_acknowlegement signal 61) that includes information that defines the identification number of the mobile station (its MSISDN) in network NW2. Then the handover proceeds as described above in the scenario of figure 4 following receipt by network NW1 of the handover request 50. The MSC of network NW1 makes a new call (call 49) to that MSISDN number. This could be done using ISUP or TUP signalling. A request 62 for this new call reaches network NW2, which sets up the call with the mobile MS 39 in the usual way for a mobile terminated call - for example by means of page and page_response messages 63, 64. The new call 49 is then set up (at 65). When the new call 49 has been set up network NW2 returns the normal message (e.g. ISUP_connect message 66) to indicate this fact to the network NW1 that originated the call 49. The network NW1 can then issue a message (indicated as a handover_confirmation message 67) to the mobile station to confirm that handover can now be made. Then the mobile station and the network NW1 connect call 47 to call 49 (at 68) so that user data that would formerly have been carried over call 47 is carried instead over call 49. Once all user data is being carried over call 49 then call 47 can be released (at 69). Handover is then complete.

Figure 6 shows the signalling used for a mobile station triggered handover when mobile originated calls are used. Initially the mobile station 39 is in communication with network NW1 over call 47. When the MS 39 discovers that inter-system handover is required it sends a handover request 70 to the MSC of network NW1. The network NW1 replies with a handover request acknowledgement message 71 to the mobile station. This handover request acknowledgement message includes information that defines a handover number assigned by the network NW1 to this handover operation. The mobile station 39 then makes a new call (call 49) to the network NW2, for example by means of a CC_setup message 72. In connection with that call the mobile station reports to the network NW2 the handover number that it has been given. This could be done by means of the CC_setup message itself. The new call 49 is then set up

(at 73). When the new call 49 has been set up network NW2 returns a message (e.g. ISUP_connect message 74) to indicate this fact to the network NW1 that originated the new call 49. As part of this message or otherwise the network NW2 also reports to the network NW1 the handover number associated with the new call. On receiving this handover number from the network NW2 the network NW1 knows that the handover can be completed by means of the new call 49. The network NW1 can then issue a handover confirmation message 75 to the mobile station to confirm that handover can now be made. Then the mobile station and the network NW1 connect call 47 to call 49 (at 76) so that user data that would formerly have been carried over call 47 is carried instead over call 49. Once all user data is being carried over call 49 then call 47 can be released (at 77). Handover is then complete.

Figure 7 shows the signalling used for a network triggered handover when mobile originated calls are used. Initially the mobile station 39 is in communication with network NW1 over call 47. When the network NW1 discovers that inter-system handover is required it sends a handover request 80 to the mobile station 39. This handover request includes information that defines a handover number assigned by the network NW1 to this handover operation. The mobile station 39 then replies with a handover request acknowledgement message 81 to the network NW1 and makes a new call (call 49) to the network NW2, for example by means of a CC_setup message 82. In connection with that call the mobile station reports to the network NW2 the handover number that it has been given. This could be done by means of the CC_setup message itself. The new call 49 is then set up (at 83). When the new call 49 has been set up network NW2 returns a message (e.g. ISUP_connect message 84) to indicate this fact to the network NW1 that originated the new call 49. As part of this message or otherwise the network NW2 also reports to the network NW1 the handover number associated with the new call. On receiving this handover number from the network NW2 the network NW1 knows that the handover can be completed by means of the new call 49. The network NW1 can then issue a handover confirmation message 85 to

the mobile station to confirm that handover can now be made. Then the mobile station and the network NW1 connect call 47 to call 49 (at 86) so that user data that would formerly have been carried over call 47 is carried instead over call 49. Once all user data is being carried over call 49 then call 47 can be released (at 87). Handover is then complete.

One situation where this handover process could usefully be implemented is when a mobile station is being handed over from a network with incomplete geographical coverage to one with greater geographical coverage. For example, the network NW1 from which the mobile station is being handed over could be a localised network or a network in the course of construction; the network NW2 to which the mobile station is being handed over could be a more extensive or more established network. The networks could be of different core network types. One specific example is where one of the networks (e.g. network NW1) is a 2G network such as a PDC network and the other network (e.g. network NW2) is a 3G network such as an IMT-2000 network.

In the case of both mobile terminated calls (figures 4 and 5) and mobile originated calls (figures 6 and 7) there is no need for any change from conventional signalling in the network to which the mobile station is being handed over. This makes the handover method very convenient to implement since there is no need to modify the existing network. Thus only one of the networks needs specifically to support the handover method. In the case of mobile originated calls (figures 6 and 7), since the handover number could be an E.164 or E.163 number, to which the mobile station is calling, conventional signalling in network NW2 can support the return of that number to the network NW1.

When the network NW2 has a greater coverage than network NW1 it is likely that the need to hand over from network NW1 to network NW2 will be more common than the need to hand over from network NW2. Thus any inability to handover easily from network NW2 to network NW1 (i.e. in the opposite direction from that

described in detail above), for example because such handover is not supported by network NW2, may not be significant.

The present invention may include any feature or combination of features disclosed herein either implicitly or explicitly or any generalisation thereof, irrespective of whether it relates to the presently claimed invention. In view of the foregoing description it will be evident to a person skilled in the art that various modifications may be made within the scope of the invention.

CLAIMS

1. A method for performing handover of a mobile station communicating in a first call via a first network to communication in a second call via a second network, comprising:

generating a request for handover;

establishing the second call between the first network and the mobile station via the second network; and

transferring data communication between the mobile station and the first network from the first call to the second call.

2. A method as claimed in claim 1, comprising the step of releasing the first call after data communication between the mobile station and the first network has been transferred from the first call to the second call.

3. A method as claimed in claim 1 or 2, wherein the mobile station generates the request for handover.

4. A method as claimed in claim 1 or 2, wherein the first network generates the request for handover.

5. A method as claimed in any preceding claim, wherein the mobile station originates the second call.

6. A method as claimed in claim 5, wherein:

the first network transmits to the mobile station data indicating an identification for the handover operation;

the mobile station transmits to the second network data indicating that identification; and

when the second call has been established the second network transmits to the first network data indicating that identification.

7. A method as claimed in any of claims 1 to 4, wherein the first network originates the second call.

8. A method as claimed in claim 7, wherein the mobile station transmits its identification in the second network to the first network and the first network uses that identification in originating the second call.

9. A method as claimed in any preceding claim, wherein the geographical coverage of the second network is greater than that of the first network.

10. A method as claimed in any preceding claim, wherein the first network is an IMT-2000 network.

11. A method as claimed in any preceding claim, wherein the second network is a PDC network.

12. A method as claimed in any preceding claim wherein the first and second networks are cellular telephone networks.

13. A method as claimed in any preceding claim, wherein the mobile station is capable of communicating by radio with the first and second networks.

14. A method for performing handover substantially as herein described with reference to figures 3 to 7 of the accompanying drawings.

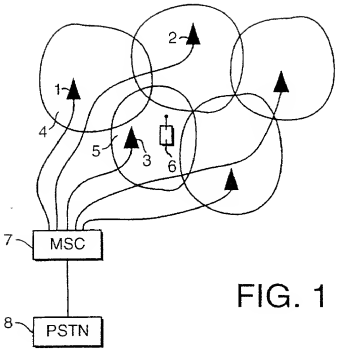

FIG. 1

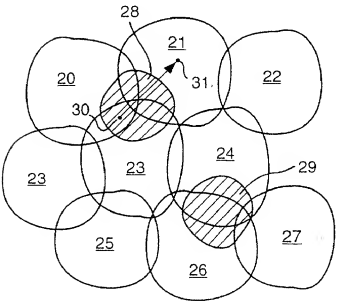

FIG. 2

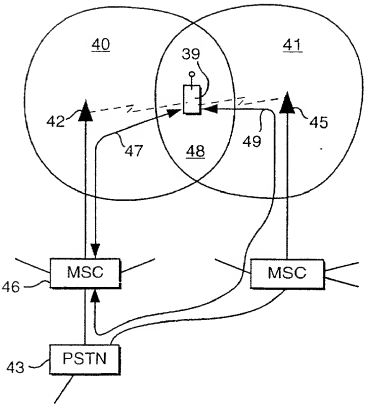

FIG. 3

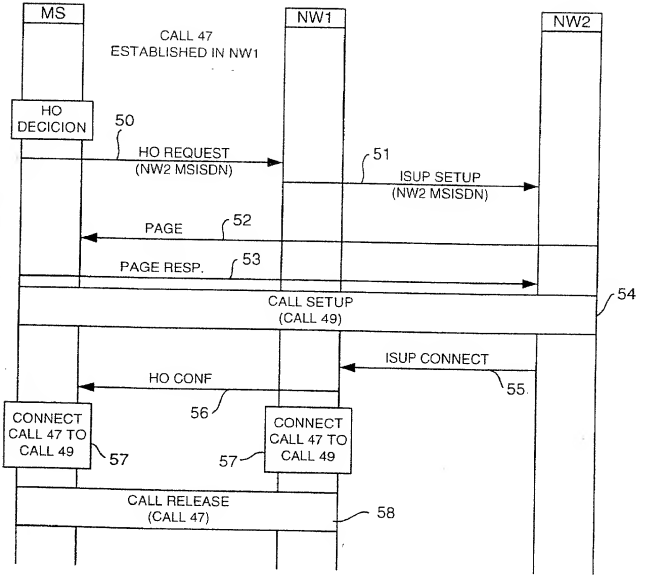
MS
NW1
NW2
CALL 47
ESTABLISHED IN NW1
HO
DECICION
50
HO REQUEST
(NW2 MSISDN)
51
ISUP SETUP
(NW2 MSISDN)
PAGE
52
PAGE RESP.
53
CALL SETUP
(CALL 49)
54
ISUP CONNECT
55
HO CONF
56
CONNECT
CALL 47 TO
CALL 49
57
CONNECT
CALL 47 TO
CALL 49
57
CALL RELEASE
(CALL 47)
58

FIG. 4

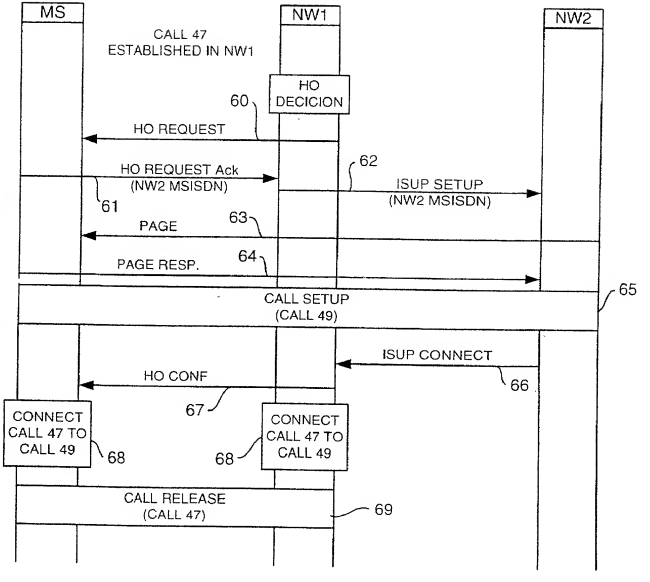
MS
NW1
NW2
CALL 47
ESTABLISHED IN NW1
HO
DECICION
60
HO REQUEST
HO REQUEST Ack
(NW2 MSISDN)
61
62
ISUP SETUP
(NW2 MSISDN)
PAGE
63
PAGE RESP.
64
CALL SETUP
(CALL 49)
65
ISUP CONNECT
66
HO CONF
67
CONNECT
CALL 47 TO
CALL 49
68
CONNECT
CALL 47 TO
CALL 49
68
CALL RELEASE
(CALL 47)
69

FIG. 5

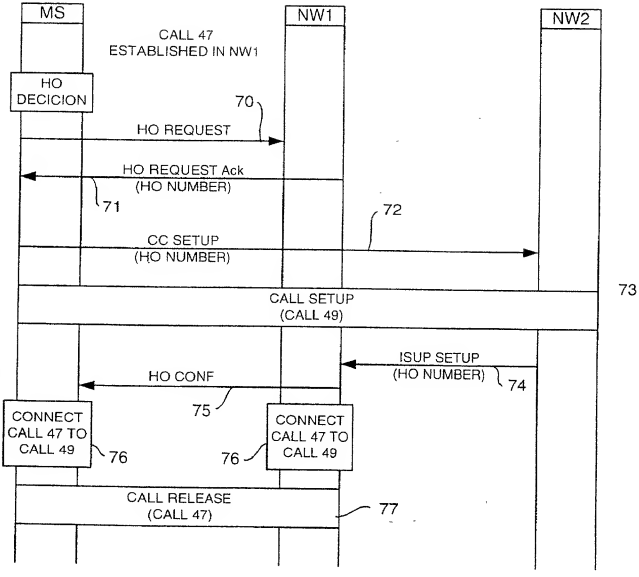
MS
NW1
NW2
CALL 47
ESTABLISHED IN NW1
HO
DECICION
70
HO REQUEST
HO REQUEST Ack
(HO NUMBER)
71
72
CC SETUP
(HO NUMBER)
73
CALL SETUP
(CALL 49)
ISUP SETUP
(HO NUMBER)
74
HO CONF
75
CONNECT
CALL 47 TO
CALL 49
76
CONNECT
CALL 47 TO
CALL 49
76
CALL RELEASE
(CALL 47)
77

FIG. 6

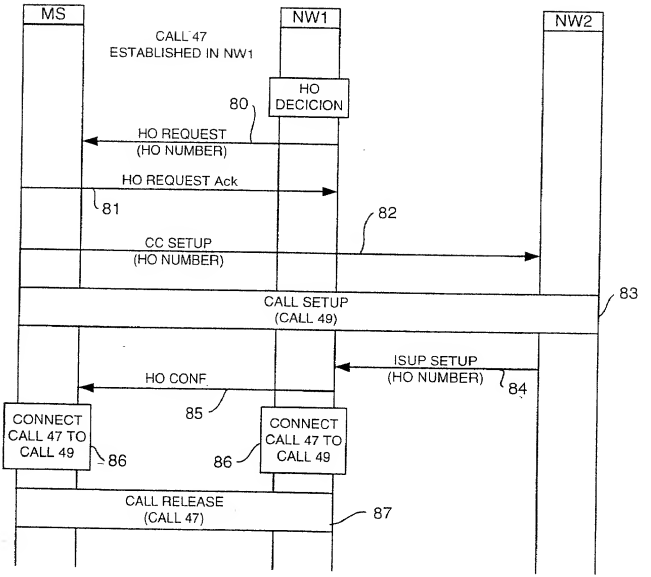
MS
NW1
NW2
CALL 47
ESTABLISHED IN NW1
HO
DECICION
80
HO REQUEST
(HO NUMBER)
HO REQUEST Ack
81
82
CC SETUP
(HO NUMBER)
83
CALL SETUP
(CALL 49)
ISUP SETUP
(HO NUMBER)
84
HO CONF
85
CONNECT
CALL 47 TO
CALL 49
86
CONNECT
CALL 47 TO
CALL 49
86
CALL RELEASE
(CALL 47)
87

FIG. 7

Docket No.
617-010120-US(PAR)

Declaration and Power of Attorney For Patent Application

English Language Declaration

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

INTER-SYSTEM HANDOVER

the specification of which

(check one)

☐ is attached hereto.

☒ was filed on ______________ as United States Application No. or PCT International Application Number **PCT/IB99/01412 filed 27 July 1999** **U.S. Serial No. 09/744,612**
and was amended on ______________
(if applicable)

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose to the United States Patent and Trademark Office all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, Section 119(a)-(d) or Section 365(b) of any foreign application(s) for patent or inventor's certificate, or Section 365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate or PCT International application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application(s) Priority Not Claimed

(Number)	(Country)	(Day/Month/Year Filed)	Priority Not Claimed
PCT/IB99/01412	**PCT**	**27/07/99**	☐
GB 9816447.8	**United Kingdom**	**28/07/98**	☐
			☐

I hereby claim the benefit under 35 U.S.C. Section 119(e) of any United States provisional application(s) listed below:

(Application Serial No.) (Filing Date)

(Application Serial No.) (Filing Date)

(Application Serial No.) (Filing Date)

I hereby claim the benefit under 35 U. S. C. Section 120 of any United States application(s), or Section 365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of 35 U.S.C. Section 112, I acknowledge the duty to disclose to the United States Patent and Trademark Office all information known to me to be material to patentability as defined in Title 37, C. F. R., Section 1.56 which became available between the filing date of the prior application and the national or PCT International filing date of this application:

(Application Serial No.) (Filing Date) (Status) (patented, pending, abandoned)

(Application Serial No.) (Filing Date) (Status) (patented, pending, abandoned)

(Application Serial No.) (Filing Date) (Status) (patented, pending, abandoned)

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. *(list name and registration number)*

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